

Amendments to the Specification:

Rewrite the paragraph at page 2, line 2 as follows.

Present telecommunication system technology includes a wide variety of wireless networking systems associated with both voice and data communications. An overview of several of these wireless networking systems is presented by Amitava Dutta-Roy, *Communications Networks for Homes*, IEEE Spectrum, pg. 26, Dec. 1999. Therein, Dutta-Roy discusses several communication protocols in the 2.4 GHz band, including IEEE 802.11 direct-sequence spread spectrum (DSSS) and frequency-hopping (FHSS) protocols. A disadvantage of these protocols is the high overhead associated with their implementation. A less complex wireless protocol known as Shared Wireless Access Protocol (SWAP) also operates in the 2.4 GHz band. This protocol has been developed by the HomeRF Working Group and is supported by North American communications companies. The SWAP protocol uses frequency-hopping spread spectrum technology to produce a data rate of 1 Mb/sec. Another less complex protocol is named ~~Bluetooth~~ Bluetooth™ after a 10th century Scandinavian king who united several Danish kingdoms. This protocol also operates in the 2.4 GHz band and advantageously offers short-range wireless communication between ~~Bluetooth~~ Bluetooth™ devices without the need for a central network.

Rewrite the paragraph at page 2, line 17 as follows.

The ~~Bluetooth~~ Bluetooth™ protocol provides a 1 Mb/sec data rate with low energy consumption for battery powered devices operating in the 2.4 GHz ISM (industrial, scientific, medical) band. The current ~~Bluetooth~~ Bluetooth™ protocol provides a 10-meter range and a maximum asymmetric data transfer rate of 723 kb/sec. The protocol supports a maximum of three voice channels for synchronous, CVSD-encoded transmission at 64 kb/sec. The ~~Bluetooth~~ Bluetooth™ protocol treats all radios as peer units except for a unique 48-bit address. At the start of any connection, the initiating unit is a temporary master. This temporary assignment, however, may change after initial communications are established. Each master may have active

connections of up to seven slaves. Such a connection between a master and one or more slaves forms a "piconet." Link management allows communication between piconets, thereby forming "scatternets." Typical ~~Bluetooth~~ Bluetooth™ master devices include cordless phone base stations, local area network (LAN) access points, laptop computers, or bridges to other networks. ~~Bluetooth~~ Bluetooth™ slave devices may include cordless handsets, cell phones, headsets, personal digital assistants, digital cameras, or computer peripherals such as printers, scanners, fax machines and other devices.

Rewrite the paragraph at page 3, line 14 as follows.

The ~~Bluetooth~~ Bluetooth™ protocol uses time-division duplex (TDD) to support bi-directional communication. Frequency hopping permits operation in noisy environments and permits multiple piconets to exist in close proximity. The frequency hopping scheme permits up to 1600 hops per second over 79 1-MHz channels or the entire 2.4 GHz ISM spectrum. Various error correcting schemes permit data packet protection by 1/3 and 2/3 rate forward error correction. Further, ~~Bluetooth~~ Bluetooth™ uses retransmission of packets for guaranteed reliability. These schemes help correct data errors, but at the expense of throughput.

Rewrite the paragraph at page 4, line 3 as follows.

The ~~Bluetooth~~ Bluetooth™ protocol is specified in detail in Specification of the Bluetooth System, Version 1.0A, July 26, 1999, which is incorporated herein by reference.

Rewrite the paragraph at page 4, line 5 as follows.

The ~~Bluetooth~~ Bluetooth™ standard currently allows only 7 active slaves within a piconet. This is because there is only a 3-bit active member address field, so there are only 8 addresses available. One of these addresses is reserved for broadcast packets, leaving only 7 addresses available for active slaves. In some cordless telephone applications, such as in a small

office environment, there may be a need to support 12 or more slave devices, i.e., cordless telephones.

Rewrite the paragraph at page 4, line 11 as follows.

It is therefore desirable to extend the addressing capabilities of wireless communication systems such as ~~Bluetooth~~ Bluetooth™ systems.

Rewrite the paragraph at page 4, line 13 as follows.

The invention provides extended addressing capability in a ~~Bluetooth~~ Bluetooth™ system. According to the invention, one existing address code in an address field of a packet is used to indicate that bits in another field of the packet represent additional address information. Further according to the present invention, the address field can be extended in order to provide a plurality of additional address codes. These extended addressing capabilities also provide backward compatibility to conventional ~~Bluetooth~~ Bluetooth™ devices.

Rewrite the paragraph at page 5, line 2 as follows.

FIGURE 1 illustrates the fields of a ~~Bluetooth~~ Bluetooth™ conventional packet header.

Rewrite the paragraph at page 5, line 6 as follows.

FIGURE 5 diagrammatically illustrates pertinent portions of exemplary embodiments of a ~~Bluetooth~~ Bluetooth™ master device that can implement the address encoding and decoding illustrated in FIGURE 2.

Rewrite the paragraph at page 6, line 6 as follows.

FIGURE 11 illustrates the header fields of an extended ~~Bluetooth~~ Bluetooth™ header according to the invention.

Rewrite the paragraph at page 7, line 2 as follows.

FIGURE 1 illustrates in tabular form the 6 fields of the packet header according to the aforementioned ~~Bluetooth~~ Bluetooth™ specification. These six fields include a total of 18 bits, which can be encoded with a 1/3 rate repetition code to form a 54-bit header. According to the present invention, one address defined by the address field AM_ADDR can be reserved as a pointer that designates additional addresses. These additional addresses can be located in the TYPE field. FIGURE 2 provides an example of how this pointer can be used to encode/decode additional addresses.

Rewrite the paragraph at page 7, line 9 as follows.

In FIGURE 2, if the address field (AM_ADDR) contains one of the first 6 addresses (001 through 110), then normal ~~Bluetooth~~ Bluetooth™ addressing can be used. These first 6 addresses can be assigned by the master device to conventional ~~Bluetooth~~ Bluetooth™ slave devices. In the example of FIGURE 2, the address 111 is used as the pointer which points to 8 other addresses which are indicated by 3 bits of the TYPE field. When a slave device reads the address 111 in the address field (AM_ADDR), it knows that 3 bits in the TYPE field correspond to an extended address. Thus, a total of $6 + 8 = 14$ slave devices (corresponding to the user numbers in FIGURE 2) can be addressed. The address 000 in the example of FIGURE 2 is reserved for broadcast packets. The TYPE bits shown as "x" in FIGURE 2 can be conventional packet type information.

Rewrite the paragraph at page 9, line 5 as follows.

In some embodiments, the auxiliary header can also be used to convey a negative acknowledgment (NAK) to a first slave device in a packet which is actually addressed to a second slave device. For example, some conventional ~~Bluetooth~~ Bluetooth™ systems reserve certain retransmission time slots for the master device to retransmit a packet to a slave device from which the master has previously received a negative acknowledgment (NAK). If the master is using a retransmission time slot to retransmit a packet to the aforementioned second slave device, the master can include the aforementioned first slave device's address in the auxiliary header of FIGURE 3. If the first slave device recognizes its address in the auxiliary header, then it knows that this represents a NAK from the master, to which it can respond, for example, by retransmitting in the next time slot. Thus, in a single time slot, the master can send a retransmission to the second slave device and a NAK to the first slave device. Although this retransmission packet from the master does not include packet type information in either the standard TYPE field (of FIGURE 1) or in the auxiliary header, the second device can determine the packet type from the conventional header bit SEQN because, in a retransmission time slot, the type of packet transmitted from the master device to the second slave device will either be a retransmission packet or a NAK packet. The second slave device can therefore use the conventional SEQN bit to determine whether the packet is a retransmission packet or a NAK packet.

Rewrite the paragraph at page 10, line 5 as follows.

FIGURE 5 diagrammatically illustrates pertinent portions of exemplary embodiments of a master device according to the invention. The master device of FIGURE 5 could be, for example, a ~~Bluetooth~~ Bluetooth™ master device provided in a base unit of a cordless telephone system. The device of FIGURE 5 includes a packet processor 51 coupled for bidirectional communication with a communications application 52 and a wireless communications interface 53. The packet processor receives communication information from the communications application 52, and can utilize well known conventional techniques to assemble the

communication information into appropriate packets. The assembled packets are then forwarded to the wireless communications interface 53, which can use well known conventional techniques to transmit the packets to a plurality of slaves via a wireless communication link 54, for example a ~~Bluetooth~~ Bluetooth™ radio link.

Rewrite the paragraph at page 11, line 17 as follows.

FIGURE 6 (taken in combination with FIGURE 5) diagrammatically illustrates pertinent portions of a master device embodiment which can implement the auxiliary header feature illustrated in FIGURES 3 and 4. The embodiment of FIGURE 6 includes an auxiliary header controller 61 which receives, at an input 62 thereof, information from the packet processor 51 indicating a new packet type in the packet flow. The auxiliary header controller 61 also receives at an input 63 thereof information from the packet processor 51 which indicates when a negative acknowledgment (NAK) needs to be sent to a particular slave. In response to the information received at 62 and 63, the auxiliary header controller 61 outputs to the packet processor 51 the aforementioned auxiliary header indicator and a suitable auxiliary header (when needed) for inclusion at a predetermined position in an outgoing packet. The packet processor 51 can accommodate the auxiliary header by extending the packet into the guard time conventionally provided between ~~Bluetooth~~ Bluetooth™ packets.

Rewrite the paragraph at page 13, line 11 as follows.

FIGURE 8 diagrammatically illustrates pertinent portions of exemplary embodiments of a slave device according to the invention. The slave device of FIGURE 8 includes a packet processor 81 coupled for bidirectional communication with a communications application 82 and a wireless communications interface 83. The packet processor 81, communications application 82 and wireless communication interface 83 can cooperate in generally the same fashion described above with respect to the corresponding components 51-53 of FIGURE 5 to permit bidirectional packet communications with a master device via a wireless communication link 84, for example a ~~Bluetooth~~ Bluetooth™ radio link. According to the present invention, an address

decoder 85 is coupled to the packet processor 81 for receiving therefrom at 86 encoded addresses, for example addresses encoded in the manner illustrated in FIGURE 2. In response to the encoded addresses received at 86, the address decoder outputs corresponding decoded addresses (for example the user numbers of FIGURE 2) to the packet processor at 87.

Rewrite the paragraph at page 16, line 9 as follows.

FIGURE 11 is similar to FIGURE 1, but illustrates an exemplary modification of the Bluetooth Bluetooth™ AM_ADDR header field according to the present invention. In the example of FIGURE 11, the AM_ADDR header field includes four bits instead of the conventional three bits. Thus, the size of the Bluetooth Bluetooth™ header is extended in FIGURE 11 by a total of three bits (assuming a 1/3 coding rate). According to the invention, the FIGURE 1 packet header with 3 AM_ADDR bits can be used to address 7 conventional slave devices (allowing one address for broadcast packets) as in the prior art, and the extended length header with four AM_ADDR bits can be used to address an additional 16 slave devices. These latter 16 slave devices must be able to perform HEC checks for both the standard header length and the extended header length, in order to ensure that they are able to identify a broadcast packet, defined for example by a 3-bit AM_ADDR of 000. On the other hand, slave devices which are equipped only to receive and perform HEC checks on standard length headers (e.g., conventional slave devices) will discard any packets having extended length headers, because the standard length HEC check can be expected to fail when applied to the extended length header.

Rewrite the paragraph at page 17, line 6 as follows.

FIGURE 12 illustrates exemplary operations which can be performed by the address encoder/decoder of FIGURE 5 in extended header embodiments according to FIGURE 11. After a user address is received at 121, it is determined at 122 whether the received user address is to be encoded using the standard length AM_ADDR header field of FIGURE 1 or the extended AM_ADDR header field of FIGURE 11. If the standard address field is selected at 122, then the appropriate standard length address code is output (to packet processor 51 of FIGURE 5) at 124.

If the extended length address field is selected at 122, then the appropriate extended length address code is output (to the packet processor 51 of FIGURE 5) at 123, along with a corresponding indicator which indicates to the packet processor 51 that the extended address field is to be used. The additional packet length necessitated by the extended header field can be easily accommodated in systems such as Bluetooth Bluetooth™ systems, by extending the packet into the guard time that is conventionally provided between packets in such systems.

Rewrite the paragraph at page 19, line 17 as follows.

Should a master send a Bluetooth Bluetooth™ ACL (asynchronous connection-less link) packet using an address defined by the four-bit AM_ADDR field described above, but during a Bluetooth Bluetooth™ SCO (synchronous connection-oriented) slot reserved for a conventional slave device which utilizes only 3 AM_ADDR bits, the conventional slave device would in this instance receive a packet whose HEC check would fail, thereby causing the conventional slave device to respond with a NAK packet in its slave-to-master time slot. At the same time, the slave device that was actually addressed using the four-bit AM_ADDR field can also be expected to respond, thus resulting in a collision. One solution to this difficulty is for the master device to avoid sending ACL packets in SCO slots reserved for conventional slave devices. Another solution is for the slave device having the 4 bit address to use a modified frequency hopping sequence relative to the conventional slave device, such that the two devices will transmit to the master on different frequencies and avoid collision.

Rewrite the paragraph at page 21, line 1 as follows.

It will be evident to workers in the art that the above-described embodiments of FIGURES 2-14 can be readily implemented, for example, by suitable modifications in software, hardware, or a combination of software and hardware, in conventional wireless packet communication devices, for example Bluetooth Bluetooth™ master and slave devices.